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(54) Rotary impeller

(57) A rotary impeller for fluids, in particular for use with self-propelled cleaning devices which are able to work in both forward and backward directions, having improved efficiency comprises a shaft (2) connectable to a motor (4) and having a headpiece (6) at its free end from which extend substantially radially at least two arms (10). An impeller blade (12) pivotally mounted on each arm has first and second major surfaces (20,20'). Two stops (14) for each impeller blade (12) are stationary relative to the headpiece (16) and define two limit positions between which each impeller blade is allowed to swivel about its arm (10). In use when the motor (4) rotates in one direction, the first impeller blade major surface (20) becomes the leading surface, and when the motor (4) changes its direction of rotation, fluid resistance causes the blades (12) to flip over from one limit position to the second limit position with the second major surface (20') becoming the leading surface.

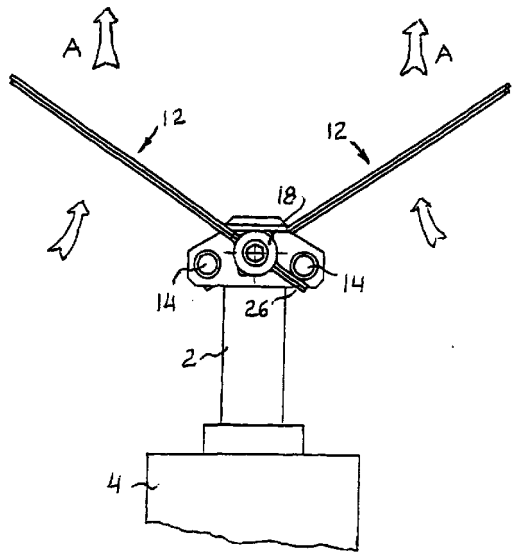

Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to a rotary impeller for fluids, in particular to an impeller for use with self-propelled cleaning devices.

Background of the Invention

[0002] Self-propelled cleaning devices are known and used, e.g., for the cleaning, automatic or otherwise, of swimming pool floors and other water-covered surfaces. Such a device, crawling along the floor, uses impellers to force the water, entraining the solids pried loose from the floor, through filters from which it emerges purified. Since, for manoevering, the cleaning devices must be able to move both in the forward and backward directions, and most known rotary impellers function only in one direction of rotation, these devices are equipped with two motors: one, reversible, for driving the device and its brushes, and one, uni-directional, for powering the impeller.

[0003] While a known centrifugal type impeller exists that works in either direction, it is of very low efficiency. Thus, for example, to obtain an output of 15 m^3/h, an impeller of this type requires a motor having a power of 600 W. The axial flow impeller according to the present invention is intended to achieve such an output with a motor of much less power, e.g., about 150 W.

[0004] It is thus one of the objects of the present invention to provide an impeller for fluids that will operate efficiently at maximum output with a minimum of power consumption, in both senses of rotation.

[0005] According to the invention, the above object is achieved by providing a rotary impeller for fluids, comprising at least two arms substantially radially extending from a headpiece; one impeller blade pivotably mounted on each of said at least two arms, said blade having first and second major surfaces; two stop means for each of said impeller blades, said stop means being stationary relative to said headpiece and defining two limit positions between which each of said impeller blades is allowed to swivel about its arm, and a shaft connectable to motor means and having said headpiece at its free end; wherein, with said motor means rotating in one sense of rotation, the first one of the surfaces of said impeller blade becomes the leading surface, and with said motor means changing its sense of rotation, fluid resistance causes said blades to flip over from one of said limit positions to the second of said limit positions, with the second one of said surfaces becoming the leading surface.

Brief Description of the Drawings

[0006] The invention will now be described in connection with certain preferred embodiments with reference to the following illustrative figures so that it may be more fully understood.

[0007] With specific reference now to the figures in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only, and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

[0008] In the drawings:

Fig. 1 is an elevational view of the impeller according to the invention;
Fig. 2 is a top view showing the headpiece, the arms about which the blades can swivel, and the stop means which limit that swivel movement;
Fig. 3 is an elevational view of one of the blades;
Fig. 4 is a side view of the blade of Fig. 3;
Fig. 5 is a perspective view showing the impeller rotating in the clockwise sense; and
Fig. 6 is a perspective view showing the impeller rotating in the counter-clockwise sense.

Description of Preferred Embodiments

[0009] Referring now to the drawings, there is seen in Figs. 1 and 2 a shaft 2 coupled to an electric motor 4 and connected at its free end to a headpiece 6. Connection is advantageously effected by a rod 8 which passes through headpiece 6 and shaft 2. The lateral portions of rod 8 extend from headpiece 6 and serve as arms 10, about each of which a blade 12 can freely swivel.

[0010] Further seen in Figs. 1 and 2 are stops 14, which, as will be explained in greater detail further below, define limit positions of blades 12 and are constituted by rods 16, advantageously press-fitted into headpiece 6 and protruding from both sides of the headpiece. Also seen in Fig. 2 are screws 18, which are screwed into arms 10 after blades 12 have been mounted thereon, to secure the axial position of the blades along arms 10, while providing enough clearance so as not to interfere with their swivel movement.

[0011] Blades 12, shown in Figs. 3 and 4, consist of two mirror-symmetrical stainless steel stampings 20, 20', fixedly connected to one another, advantageously by spot-welding (the markings of likely locations of welding spots are shown in Fig. 3). Close to its lower end, each of the blade halves 20, 20' is provided with a V-shaped depression 22, 22' across its entire width, the angle of the V being 90°. When the two halves are joined, depressions 22, 22' form a passage 24 having a

square cross-section, which fits over arms 10 with sufficient clearance to permit the blades 12 to swivel about the arms 10. Narrow strip 26, 26' below passage 24 serves as counterpart to stops 14, against which it abuts, as shown in Fig. 1.

[0012] The working principle of the impeller according to the invention is best understood from Figs. 5 and 6. In Fig. 5, motor 4 and, therefore, shaft 2, rotate in the clockwise sense, as indicated by arrows *B*. Given the inclination of blades 12, it is clear that blade surfaces 20 will impel the water upwards, in the direction of arrows A in Fig. 1. Stops 14 determine the limit position of blades 12, and surfaces 20 are the leading surfaces.

[0013] When motor 4 now changes its direction of rotation (arrows *C*), water resistance will cause blades 12 to flip over from the limit position of Fig. 5 to the limit position of Fig. 6, with surfaces 20' now becoming the leading surfaces. Again, given the inclination of blades 12, blade surfaces 20' will clearly impel the water upwards, in the direction of arrows *A* in Fig. 1.

[0014] Although the use of single rods 8 and 16 to produce arms 10 and stops 14, respectively, is the preferred and most efficient way to ensure the secure joining of all components involved, it is obviously possible to have two separate arms 10 and four separate stops 14 individually joined to headpiece 6.

[0015] It will be evident to those skilled in the art that the invention is not limited to the details of the foregoing illustrated embodiments and that the present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

Claims

1. A rotary impeller for fluids, comprising:

at least two arms substantially radially extending from a headpiece;
one impeller blade pivotably mounted on each of said at least two arms, said blade having first and second major surfaces;
two stop means for each of said impeller blades, said stop means being stationary relative to said headpiece and defining two limit positions between which each of said impeller blades is allowed to swivel about its arm, and
a shaft connectable to motor means and having said headpiece at its free end;
wherein, with said motor means rotating in one sense of rotation, the first one of the surfaces of said impeller blade becomes the leading surface, and with said motor means changing its sense of rotation, fluid resistance causes said blades to flip over from one of said limit positions to the second of said limit positions, with the second one of said surfaces becoming the leading surface.

2. The impeller as claimed in claim 1, wherein said at least two arms are the two lateral portions of a single rod.

3. The impeller as claimed in claim 2, wherein said single rod also serves to fixedly connect said shaft and said headpiece.

4. The impeller as claimed in claim 1, wherein each of said blades consists of two halves joined to one another, each half being provided with a V-shaped depression across its entire width, said depressions forming a passage having a square cross-section when said halves are joined.

5. A rotary impeller for fluids as claimed in claim 1, substantially as hereinbefore described and with reference to the accompanying drawings.

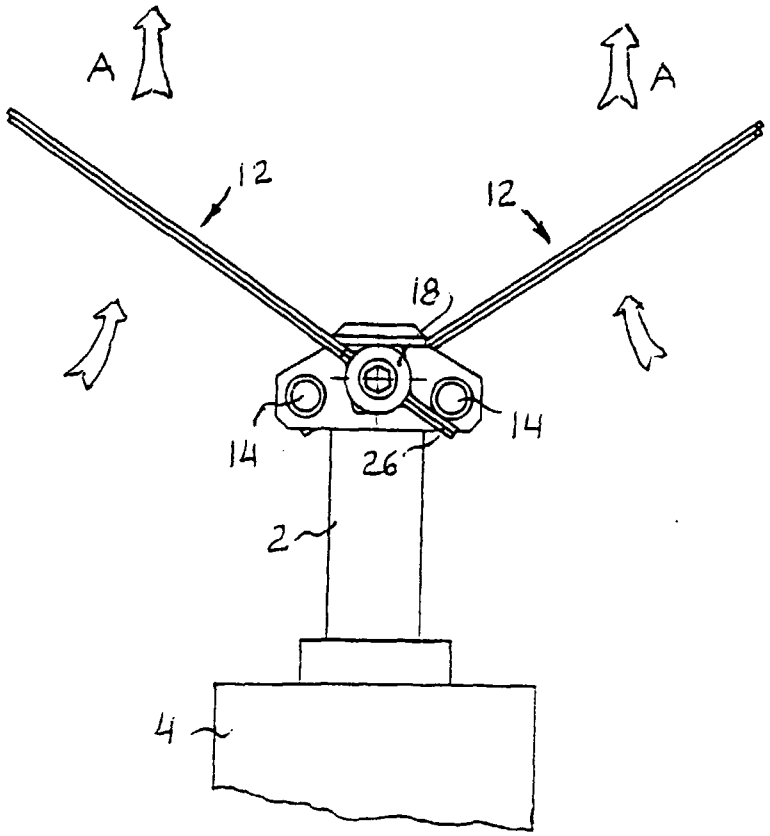

Fig. 1

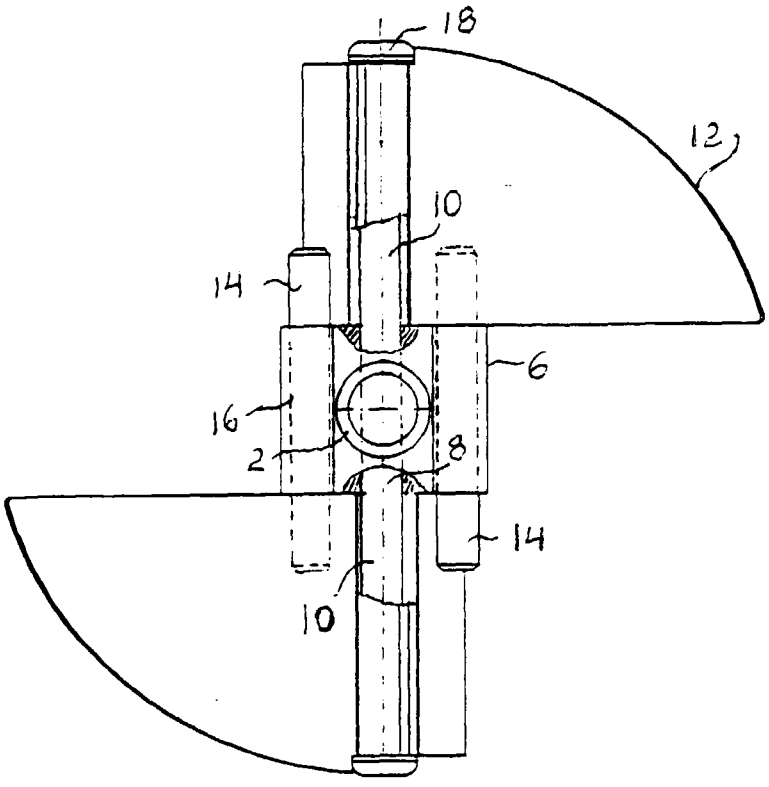

Fig. 2

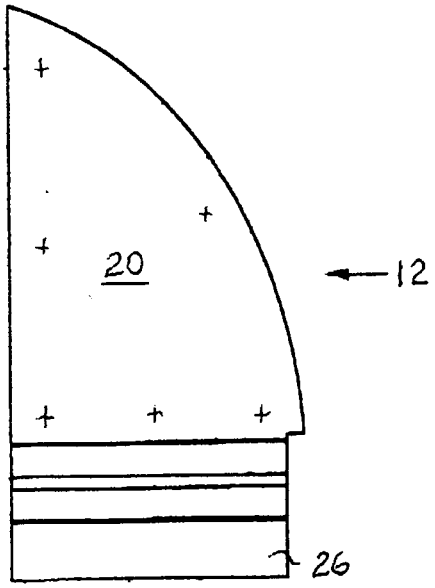

Fig. 3

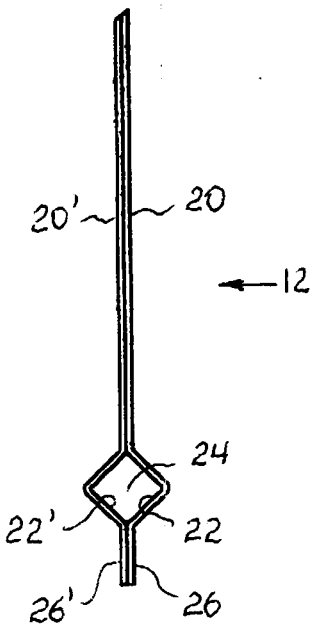

Fig. 4

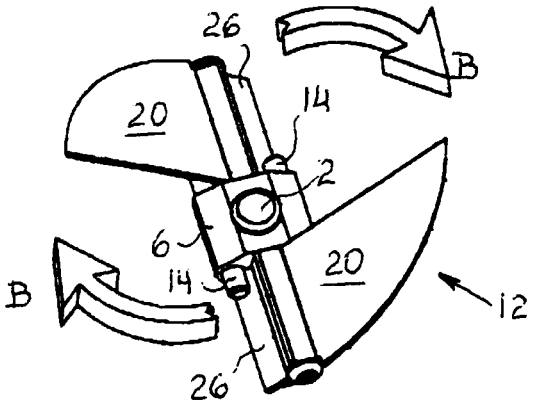

Fig. 5

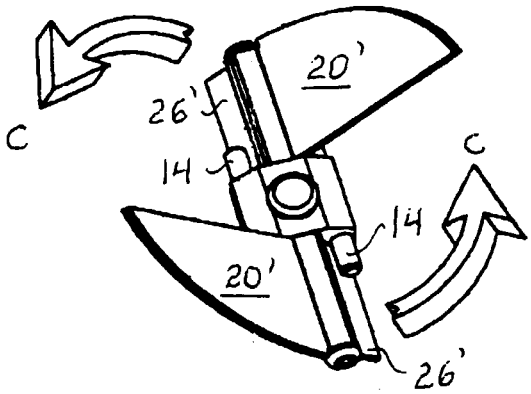

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 0996

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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X Y	FR 2 090 429 A (DURAND FRANCOIS) 14 January 1972 (1972-01-14) * the whole document *	1 2	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 June 2000	Teerling, J

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 20 0996

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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